WHAT IS CLAIMED IS:

1. An olefin polymerization catalyst prepared by a process comprising contacting (A) and (B), or (A), (B) and (C) described below:

(A) a transition metal compound in which the number of a transition metal is the same as that of group having a cyclopentadiene type anion skeleton, in its molecule,

(B) at least one aluminum compound selected from the following (B1) to (B3);

(B1) an organoaluminum compound represented by the general formula $E^1_aAlZ_{3-a}$,

(B2) a cyclic aluminoxane having a structure represented by the general formula $\{-Al(E^2)-O-\}_b$, and

(B3) a linear aluminoxane having a structure represented by the general formula $E^3\{-Al(E^3)-O-\}_cAlE^3_2$,

wherein E^1, E^2 and E^3 respectively represent a hydrocarbon group, all of E^1, E^2 and E^3 may be the same or different, Z represents a hydrogen atom or a halogen atom, and all of Z may be the same or different, a represents a numeral satisfying $0<a\leqq 3$, b represents an integer of not less than 2, and c represents an integer of not less than 1; and

(C) a modified aluminumoxy compound obtained by reacting an aluminumoxy compound (C1) with a boron compound (C2) represented by the general formula $BQ^1Q^2Q^3$,

wherein B is a boron atom in the trivalent valence state; and Q^1, Q^2 and Q^3 are respectively a halogen atom, a hydrocarbon group, a halogenated hydrocarbon group, a substituted silyl group, an alkoxy group or a di-substituted amino group, and

they may be the same or different.

2. The olefin polymerization catalyst according to claim 1, wherein (C1) is (C1a) and/or (C1b) described below:

(C1a) a cyclic aluminoxane having a structure represented by the general formula $\{-Al(E^2)-O-\}_b$, and

(C1b) a linear aluminoxane having a structure represented by the general formula $E^3\{-Al(E^3)-O-\}_cAlE^3_2$, wherein E^2 and E^3 respectively represent a hydrocarbon group, all of E^2 and all of E^3 may be the same or different, b represents an integer of not less than 2, and c represents an integer of not less than 1.

3. The olefin polymerization catalyst according to claim 1, wherein respective Q^1, Q^2 and Q^3 are a halogenated hydrocarbon group.

4. The olefin polymerization catalyst according to claim 1, wherein the modified aluminumoxy compound(C) is obtained by reacting the aluminumoxy compound (C1) with the boron compound (C2) at a temperature of from 50℃ to 150℃.

5. The olefin polymerization catalyst according to claim 1, wherein the transition metal compound (A) is a transition metal compound represented by the general formula (I) or (II):

$$CpMX^1_3 \qquad (I)$$

$$(CpMX^1_m)_2X^2_{3-m} \qquad (II),$$

wherein M represents a transition metal atom of the Group IV of the Periodic Table of the Elements; Cp represents a group having a cyclopentadiene type anion skeleton; each of X^1's independently represents a hydrogen atom, a halogen

atom, an alkyl group, an aralkyl group, an aryl group, a substituted silyl group, an alkoxy group, an aralkyloxy group, an aryloxy group, a di-substituted amino group, an alkylthio group, an aralkylthio group, an arylthio group, an alkylseleno group, an aralkylseleno group or arylseleno group; X^2 represents an atom of Group XVI of the Periodic Table of the Elements; m is 1 or 2; when a plurarity of respective Cp, M, X^1 and X^2 exists, they may be respectively the same or different, and Cp may be bonded to X^1 directly or through a bridging group.

6. The olefin polymerization catalyst according to claim 5, wherein (A) is a transition compound in which Cp and X^1 in the general formula (I) or (II) are bonded each other through a bridging group.

7. The olefin polymerization catalyst according to claim 1, wherein (A) is a transition metal compound represented by the general formula (III) or (IV) below:

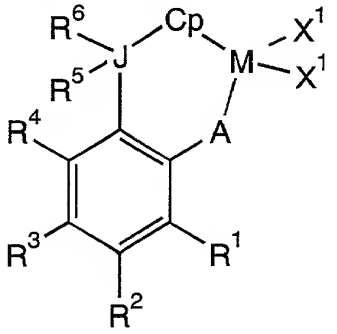
$$CpYMX^1_2 \qquad \text{(III)}$$

$$(CpYMX^1_n)_2X^2_{2-n} \qquad \text{(IV)},$$

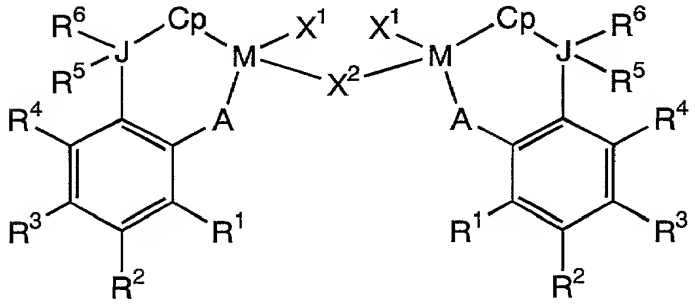
wherein respective M, Cp, X^1 and X^2 is the same as defined in the general formula (I)or (II) above; Y is a group having an atom of the Group XV or XVI of the Periodic Table of the Elements and σ-bonding to M through the atom in the group; Cp and X^1 may be bonded each other directly or through a bridging group; n is 0 or 1; and a plurarity of respective Cp, M, X^1 and X^2 may be the same or different.

8. The olefin polymerization catalyst according to claim 1, wherein (A) is a transition metal compound selected from

the group consisting of transition compounds represented by the general formulas (I), (II) or (III);

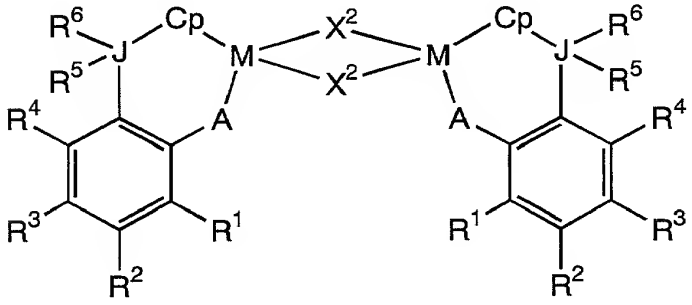


(I)



(II)

, or



(III)

,

wherein, in the general formula (I), (II] or (III], M represents a transition metal atom of the Group IV of the Periodic Table of the Elements; A represents an atom of the Group XVI of the Periodic Table of the Elements; J represents an atom of the Group XIV of the Periodic Table of the Elements; Cp represents a group having a cyclopentadiene type anion skeleton; each of X^1, R^1, R^2, R^3, R^4, R^5 and R^6 independently represents a hydrogen atom, a halogen atom, an alkyl group,

an aralkyl group, an aryl group, a substituted silyl group, an alkoxy group, an aralkyloxy group, an aryloxy group, a di-substituted amino group, an alkylthio group, an aralkylthio group, an arylthio group, an alkylseleno group, an aralkylseleno group or arylseleno group; X^2 represents an atom of Group XVI of the Periodic Table of the Elements; R^1, R^2, R^3, R^4, R^5 and R^6 may be optionally combined with each other to form a ring; and in the general formula (II) or (III), two of M, A, J, Cp, X^1, X^2, X^3, R^1, R^2, R^3, R^4, R^5 and R^6 may be respectively the same or different.

9. The olefin polymerization catalyst according to claim 1, wherein (B) is an organoaluminum compound selected from the group consisting of triethylaluminum, triisobutylaluminum, methylaluminoxane, methylisobutylaluminoxane and butylaluminoxane.

10. A process for producing an olefin polymer which comprises polymerizing an olefin with the olefin polymerization catalyst of any one of claims 1 to 9.

11. The process for producing an olefin polymer according to claim 10, wherein the olefin polymer is a copolymer of ethylene and an α-olefin having 3 to 20 carbon atoms.

12. The process for producing an olefin polymer according to claim 10, the polymerization temperature is 150 to 300℃.

13. The process for producing an olefin polymer according to claim 11, the polymerization temperature is 150 to 300℃.